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Re-Negotiating Protocols: A Way to Integrate Group Ware in Collaborative Learning Settings

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Abstract

Research is being done within the Computer Supported Collaborative Learning community to investigate how to apply the approach of Problem Oriented Project Pedagogy in distance learning using groupware. Successful implementation of groupware in distributed collaborative settings is not without difficulties. Investigations of different problems are needed to find how to get distributed groups in educational settings to collaborate using groupware. This paper addresses the question: How do we successfully implement groupware in distributed groups in educational settings? The paper reports from an empirical action research study of four geographical distributed project groups within two different Master Education programs in Denmark, and argues that re-negotiating protocols for collaboration is essential for success with organizational implementation of groupware in distributed project groups.

Keywords

CSCL, CSCW, communities of practice, distributed groups, Master Education, organizational implementation, protocols and situated actions.

1. Introduction

Lisa, Thomas and Emma comprise a geographically distributed group participating in a Master Education program based on Problem Oriented Project Work in groups. They have full-time jobs, and families, and have few opportunities to meet and discuss the essential topics of the project they are engaged in. To facilitate group work, they use a web-based groupware system, which is supposed to support their need for collaboration in the distributed setting. This is the case and setting this paper addresses.

Problem Oriented Project Pedagogy has been the pedagogical cornerstone of Roskilde University and Aalborg University since the early 1970s (International Conference on Project Work in University Studies 1997, Olesen & Jensen 1999). In Problem Oriented Project Work the students collaborate in groups throughout a semester, defining and exploring real-life problems with relevant theory and empirical work. The teacher's role is to supervise the students' work through critical questions to stimulate reflection and learning. Learning is viewed as a social construction of knowledge and the pedagogy is based on the constructivism perspective. At Roskilde University 50 percent of the education is based on Problem Oriented Project Work and 50 percent on courses and other teacher-guided activities. In the 1990s the Danish government took initiatives to enable adults active on the labour market to attend university; consequently the universities teaching Problem Oriented Project Work developed part-time Master programs based on group work.

The Master programs started by offering computer-supported-collaborative-learning-systems to increase the possibility for collaboration irrespective of the geographical distribution of the groups. The challenge for research in Computer Supported Collaborative Learning begins here. When applying an IT-system in a group context, the general question is: How can we encourage the group to increase collaboration? Introduction of a new IT-system often temporarily disrupt efficiency, even under the best circumstance (Grudin & Grinter 1995, p. 56). Organizational implementation of groupware is especially difficult if the mental models that promote collaboration are absent, because the way people think influences the integration of groupware technology (Orlikowski 1992). Buying 'off-the-shelf' groupware is not enough to secure collaboration, and such a strategy is likely to fail (Grudin 1994). Success with groupware depends on the introduction; without a good introduction the strategies of collaborative learning will fail. This is why I explore the question: How is groupware successfully implemented in distributed groups in educational settings?

The 1990s saw the emergence of an international community within the Computer Supported Collaborative Learning (CSCL) investigating the social collaborative nature of learning (first conference in 1995). The community's approach was in line with the approach Problem Oriented Project Pedagogy. Investigating collaborative learning requires a theory of social learning and researchers within this community turned to Lave & Wenger' Community of Practice (1991), see e.g. George & Leroux (2001), Dirckinck-Holmfeld & Fibiger (2002), Dirckinck-Holmfeld & Sorensen (1999), Dirckinck-Holmfeld, Tolsby & Nyvang (2002) and Svensson (2002). The approach of this investigation is Wenger (1998). Studying the educational setting the goal has been establishment and maintaining the project groups as communities of practice. This necessitates creating a common understanding of the collaboration including both explicit and tacit knowledge. The strategy has been to assist the group to develop *reification* for their collaboration over time.

In this paper the protocol-concept grounded in the research community of Computer Supported Cooperative Work (CSCW) is applied in a collaborative learning setting. When collaborating, participants must engage in activities extraneous to the activities that contribute directly to the work (Schmidt & Bannon 1992, p. 14). These activities are referred to as articulation work. Reducing the complexity of articulation work is a major issue within the research field of CSCW, and one perspective is the concept of coordination mechanisms. Coordination mechanism consists of protocols of coordination embedded in a computational artefact (Schmidt & Simone 1996, Pors & Simonsen 2003). We have learned from the debate of 'the coordinator' (Suchman 1994) that IT-systems have categories (protocols) inscribed and embedded in the technology (artefacts). This means that groupware has inscribed protocols that stipulate how to use the technology most efficiently. The strategy using the protocol-concept was to assist the group to establish and maintain *protocols* for collaboration that may be supported by the groupware system. In Wenger terms protocols are reifications for the collaboration. Protocols are 'images of collaboration'.

When trying to stipulate working procedures through protocols, it is essential to understand the character of the work setting. Behind all collaboration is an underlying structure for actions (Suchman 1983). The underlying structure is typically represented as knowledge or information flow when identified by IT-designers, and observed 'misunderstandings of the information flow' are characterized as the incompleteness of the procedural specifications. Suchman suggests changing this view and instead view the problematic nature of procedural specifications as a reflection of some enduring structure that stands behind the work. Her concept is to find the meaning of organizational plans by investigating practical actions. Suchman suggests that structures of an organizational unit are located in the organization of practical action, rather than in procedural specifications. Following the work of Suchman (1983, 1987) the investigation differentiates between *practical protocols* and *procedural protocols*, where practical protocols refer to practical actions and procedural protocols refer to procedural specifications.

The overall strategy for investigating organisational implementation of groupware in geographically distributed groups in Master Education programs, was to assist the group to become a community of practice, reducing the complexity of articulation work through explicitness of emerging practical and situated protocols for collaboration. Reduction of articulation work is essential for part-time education, because every time learners have to use extra effort coordinating the time available for studying is reduced. When the effort needed to coordinate decreases, time for learning increases and this is why re-negotiation of protocols is an important contribution to research within the CSCL. Owing to the lack of good examples of how to successfully implement groupware in organizations, an Action Research project was conducted aiming to implement groupware in collaborative learning settings, and the implementation was a success!

The investigation exposed different factors for success, and one of the main observations was the importance of re-negotiating protocols in the project groups. I argue that efficient use of groupware technology requires adjusting the collaboration to the inscribed protocols in the technology, and if a protocol is to be integrated in a community of practice, it is a critical condition, that the protocol is a situated reification for the collaboration. It is essential the protocol emerge from practice. Emerging protocols are implicit and tacit, and we need to make them explicit, when using them to reduce the complexity of articulation work. Because practical protocols are located in organization of practical actions, the explicitness needs to be grounded in practical actions. This means that the negotiation of protocols, when establishing a project group, is not enough to integrate the protocols, because at this stage there are no practical actions. This is why *re-negotiation of protocols* is essential for

success in organizational implementation of groupware in geographically distributed groups in educational settings.

The rest of this paper has three parts. First the research method and the activities conducted during the investigation are briefly presented. Followed by an in-depth description of the empirical research findings, which are the main part of the paper. Finally the conclusion presents a discussion of the findings, relating them to the framework of situated and practical actions.

2. Research Method

2.1 Action Research, the Case Study and BSCW

Using the Action Research approach in the Information Systems (IS) community is well known (Mathiassen 1998, 2002, Avison, Lau, Myers & Nielsen 1999). The IS Action Research approach combines theory and practice through change and reflection in a problematic real-life situation. The empirical study presented in this paper investigated the overall research question: Which conditions, challenges, problems and needs exist in organizational implementation and use of groupware in geographical distributed groups at Master Education programs?

This question was studied within two different Master Education programs: The Master of Adult Education at Roskilde University and the Master of ICT and Learning at the IT-university of western Denmark. Through the research process four project groups were followed from their establishment until the exams, in some periods closer than others. The researcher had no direct connection to the Master programs, and was not one of the teachers within the education. The research project was presented to the students in the beginning of the semester, where the students were asked if they would participate. In that way the students were well aware they were participating in a research project. The role of the researcher was to act as an outside facilitator and process-supervisor integrating groupware in the project groups. It was made explicit to the students, that integration of groupware was to support their collaboration, and if they did not find the groupware useful they should state this and the research would focus on why groupware was not perceived as useful. This approach affected the students' behaviour to be critical towards the technology and they clearly state throughout the investigation if they were unhappy with the technology and what they would like to change.

The study exposed different factors important for organizational implementation of groupware in distance educational settings, among others were: the researchers facilitator-role, the students perceived usefulness of the technology, the unarticulated need for social awareness which was unexpectedly meet by the technology, and the malleability of the technology. One factor was the importance of re-negotiation of protocols, and this paper illustrates this factor by extracting empirical findings from one of the groups. The group consists of three members: Lisa, Thomas and Emma. Lisa and Emma living in east Denmark but far from each other, and Thomas living in west Denmark. The research was conducted during their last year at the university. They all had first hand experience with Problem Oriented Project Work but not with groupware.

The groupware system used in the investigation was Basic Support for Cooperative Work (BSCW, bscw.gmd.de), one of the most well known CSCW systems in the academic world (Bentley, Horstmann & Trevor 1997). The BSCW system is a web-based CSCW system, which supports advance file-management, asynchronous and synchronic dialogs, collection of URLs and calendar

functions. The BSCW system also supports different awareness functions (Prinz 1999) such as monitoring which documents, folders and notes are new, read, revised or moved. It is also possible to get direct notifications by email, when different events occur within the system. Because there are great possibilities to adjust the conceptual structures in BSCW, it is a strong tool, when needing to collaborate and coordinate different tasks within a distributed group.

2.2 The activities and intervention

The research took place from September 2001 to June 2002. During the year four physical activities was conducted to integrate BSCW in the group. The activities were a project establishment session in November 2001, and three reflective evaluation sessions in January 2002, March 2002 and April 2002. The intervention in these activities was in form of process-supervision from the researcher e.g. asking reflective questions, suggesting initiatives and assisting in explaining and changing the technology. Besides the physical activities the virtual collaboration within the BSCW was observed. The activities was captured and turned into empirical data for analysing by combining workshops and group interviews inspired by Kensing, Simonsen & Bødker (1998), using wall graphs, diagrams, drawings and tape recordings. These results were combined with a personal log with observations of the virtual collaboration. This log was kept by the researcher and used for reflection on the observed behaviour within BSCW.

3. Empirical Study

3.1 Negotiation of Future Procedural Protocols

The Master students began their last year of the Master program in September 2001. From September to November they followed physical co-located seminars and formed project groups, and the venture with Lisa, Thomas and Emma began.

In November 2001 the group was supervised in doing the activity called *establishment of the project group*. Here, the group negotiated a procedural protocol for future work and developed a common understanding for the use of BSCW. The understanding was based on the group's earlier experience with Problem Oriented Project Work in groups combined with presentation of examples in how to use BSCW efficiently in the setting. The understanding was then used to design the conceptual structures of the BSCW e.g. which folders under which names should exist, and more important, *how* the participants should use the different folders. The result of the activity was a project contract describing the protocols, an overall plan for the project period, and a designed BSCW workspace.

3.2 Re-Negotiating Protocols: from Procedural to Practical Protocols

Common understanding of described and negotiated protocols is not a static aspect. It evolves over time and is flexible for local interpretation. This is why evaluation of the collaboration process is needed. The group needs to articulate the situated actions occurred in the period, to be able to re-negotiate the procedural protocols turning them into practical protocols, to increase the common understanding of the collaboration. So the group received supervision to do a reflective evaluation

activity in January 2002. Here the group was encouraged to articulate the actual collaboration process experienced from November to January, and assisted to use the result to redefine the plan and re-design the conceptual structures in BSCW.

The activity was crucial to the integration of BSCW in the group, and had a huge impact on the future work. First of all, at the time when the activity was performed the group had *not succeeded* in integrating BSCW in their collaboration. As an outsider to the group, only knowing their work through events at BSCW, their project and collaboration was a mystery with no clues to, what the group had been doing in the period. The main reason was the missing activity in BSCW. So what had the group been doing in the period, and why had they not used BSCW? An obvious answer was, that the group had no need for the technology due to absent coordination-tasks in the period. But this was not the case.

The group explained, that they had a 'dead period' just after the activity in November. A 'dead period' is when all are busy with family and work leaving little time for the project. Around Christmas the need for communication emerged, because of the forthcoming meeting with their teacher in January. They had to produce a document, presenting their problem statement and method. When the deadline approached, the group held a phone meeting planning the coordination assignment.

> *"Around Christmas we held a phone-meeting, about the document to our teacher, because Lisa and I had to make something fast, we agreed on using email instead of BSCW – and that's what happened." (Thomas, in the evaluation meeting in January 2002).*

Apparently the group had chosen phone meeting and email over BSCW for coordinating the document process, but why? The group explained, that during the establishment activity in November, a clear image of their project, and how BSCW could support their collaboration emerged. The following 'dead period' blurred that clear image, and the BSCW became a 'stranger out there'.

> *"That thing with the BSCW. It is like, that when you are not there – as long as the working process is not continuously –it gets like you logon and look, but nothing happens – and after a short while, it's like a stranger out there." (Emma, in the evaluation meeting in January 2002)*

The blurred image of the collaboration, caused by the 'dead period', had two results. First the group forgot the technical functions in BSCW, due to lack of regular use. They did not get the technology 'under the skin', which was an obstacle in the implementation process of the groupware. Second the group forgot the procedural protocols negotiated in November, due to the same reason. Because the group did not collaborate straight after the establishment meeting in November, the organizational implementation failed. The clear image of the project, process and technology from November got blurred. When communication was required for coordinating the document, the blurred image made the combination of both producing the document and integrating the BSCW in the collaboration, a too large mountain to climb. Consequently they chose a known technology for the purpose: email.

So did the coordination through email work satisfactorily? The answer is no. The group expected to have a common understanding of the process around- and content of- the document produced. But discussions triggered by the supervision in January exposed differences of both process and content. It was revealed that there were different versions of the document, and that none of the participants

had a printed copy of the most recent one. Furthermore it was revealed that the final version was on Thomas' home computer, which they did not have access to from campus.

> *"There are some pages missing … (This isn't the last version you sent?) No it is not. (The one you sent a couple of days ago?) The document we sent to Sebastian [the teacher], the one we called version 4. It was the version Lisa had re-written. Unfortunately I don't have a printed version, because my printer isn't working. But Lisa has combined our original versions, it is about 6-7 pages long." (Thomas and Emma, in the evaluation meeting in January 2002)*

The missing document caused a problem, because it is a central part of the meeting with the teacher. Due to the email coordination, not all had read the final version, and they had no printed version on campus. What happened in January was, that due to the breakdown in the communication-process producing the document, the group re-negotiated their procedural protocols from November turning them into practical protocols. But what were the difference between the negotiation session in November and the re-negotiation session in January? Comparing the two sessions some clear differences appear. One difference is the role of the researcher in these sessions. In the first session the researcher had a dominating role, when implicitly presenting pre-scripted protocols for the group to negotiate. These protocols where inscribed in the examples of reifications e.g. the project contract and conceptual structures of BSCW. These reifications were needed in the session, because the group did not have any experience in using groupware, and to negotiate future work through groupware, they needed an idea of the opportunities, problems and challenges that lie within groupware technology. In the second session the researcher had a completely different role, much more withdrawn. The researcher questioned the group about their actions in the period, assisting them to articulate their work. Beside the differences in the researcher's role, there was an important difference in the focus of the two sessions. Focus in the first session was for the group to formulate pre-scripted protocols and define them as procedural protocols for future work and capture the essence in the reifications (project contract, plan and conceptual structure at BSCW). In the second session the goal were to articulate their situated actions from January to November. They described their experienced work, which at the same time would be a description of the group's practical protocol. Through the discussion, the tacit aspects of their collaboration were exposed, which made it possible for the group to reflect explicitly on their work. The articulation-process increased the common understanding of the collaboration, aligning the misunderstandings and thereby conceived a re-negotiated protocol grounded in practical actions. The result was a revised procedural protocol for future work, but this time the protocol had emerged from practice and not speculations.

After having re-negotiated the protocol five initiatives of intervention were decided on to accommodate the difficulties experienced in the period. The initiatives were: 1) a new introduction of the BSCW technology, 2) the production of a written introduction to the technical functionalities in BSCW, 3) the direct notification was activated so the participants got email whenever written and revising events occurred, 4) the development of three scenarios describing the usage of BSCW for different coordination tasks, and 5) establishment of a so-called weekly-logbook.

How these initiatives and the re-negotiation of protocols had influenced the integration of BSCW was investigated in March 2002. Based on observations of the virtual collaboration in the period from January to March, a completely different picture of the group's collaboration emerged. The group had managed to beneficially integrate BSCW in their collaboration. This was revealed by the massive amount of actions in the BSCW system – especially in the weekly-logbook. It was clear

that the group had a mutual understanding of the project, process and document. In January they used almost all the time finding out which documents existed; this was a minor issue in March. When articulating their work in March something interesting emerged. A phone meeting planned in January had been cancelled. Instead they had used the BSCW to coordinate their activities. They needed a phone meeting between Christmas and New Year to coordinate, but the need was reduced between January and March. The BSCW was no longer 'a stranger out there' it had become 'a friend'.

4. Conclusion

IT-systems have inscribed categories (protocols) embedded (Suchman 1994). Efficient use of groupware technology requires adjusting the collaboration to the inscribed protocols in the groupware. Awareness of this aspect necessitates the importance of choosing a technology that supports the collaboration process, so the protocols enables instead of constrains the collaboration (Grudin et al. 1995). In my study the inscribed protocols in BSCW stipulates that the group needed an explicit planning of the project that could be inscribed in the possible conceptual structures of folders and documents. Knowledge of the inscribed protocols, and how these can support a collaborative learning process based on Problem Oriented Project Work, was presented to the group at the session in November, by the presented reifications such as the example of project contract, plan and structures of BSCW. The negotiation process involved the interaction of two constituent processes, the process of adjusting the group to the inscribed protocol of BSCW, and the process of adjusting the BSCW to support the collaboration process. This was done in the creation of procedural protocols for future collaboration, based on the group's earlier experience performing Problem Oriented Project Work and the suggested reifications presented by the researcher.

Negotiating the procedural protocols gave the group a clear image of the project and how BSCW could support their needs for distance collaboration. But the image was blurred due to the 'dead period', which resulted in the group forgetting both the technical functions and the procedural protocols. The group did not succeed in integrating the groupware and the protocols as reifications for practice, because they did not have any practice. The group had not been established as a community of practice, but why? If a protocol is to be reification for collaboration in a community of practice, the reification has to have a 'meaning' in the community. Meaning evolves from practice through participation in practice (Wenger 1998, p. 52) and can be viewed as an implicit structure located in practical actions (Suchman 1983). Reducing the complexity of articulation work by adjusting both the collaboration process to the embedded protocols in the groupware technology, and the protocols embedded to the collaboration process, one needs to make the underlying structures located in the practical actions explicit. To do so there has to be a period of practice. This is why the negotiation process of procedural protocols, when establishing a group, is not enough to integrate the protocol, because at that stage there are no practical actions.

So how do we successfully implement groupware to support collaborative learning in distributed project groups? The venture with the four groups within the two Master Education programs exposed many different essential factors for success, e.g. the researchers facilitator-role, the students perceived usefulness of the technology, the unarticulated need for social awareness which was unexpectedly meet by the technology, and the malleability of the technology, but one of the main observations was; protocols integrated in a community of practice have to be *practical*

protocols connected with a meaning to be reifications for collaboration. This is why *re*-negotiating protocols is essential, because it is by this process that the procedural protocol evolves to a practical protocol. In the re-negotiation process the explicitness of protocols are grounded in practical actions.

Even though the empirical data presented in this paper is a small-scale case study, I would argue that the findings are of more general nature. First of all because the theoretical concepts used in this paper supports and clarify the findings, and secondly because my earlier experience through six years, both as a participant and as an observer, of distributed and co-located project groups within educational settings also supports the findings. Still we need new research on groupware support of distributed project groups, both in a quantitative and a qualitative sense to get a better understanding of the relationship between distributed collaboration and groupware technology, with the aim of designing new technologies and developing new ways for integrating groupware technologies to support learning in distributed collaborative settings.

If one succeeds in integrating groupware in distributed project-groups in educational settings, using groupware can increase the possibility to establish the group as a community of practice. Being established as a community of practice, the group will be able to discuss and reflect on essential topics of the study-project and thereby having better opportunities for collaborative learning instead of wasting energy on articulation work.

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